PORSF
11.3.17
04/14/2005 DRAFT

FRED DEVINE DIVING AND SALVAGE, INC.

Oregon DEQ ECSI #: 2365

6211 North Ensign Street
DEQ Site Mgr: Mark Pugh
Latitude: 45.5675°
Longitude: -122.7152°
Township/Range/Section: 1N/1E/17

River Mile: 8 East bank

LWG Member ☐ Yes ☒ No

Upland Analytical Data Status: ☐ Electronic Data Available ☒ Hardcopies only

1. SUMMARY OF POTENTIAL CONTAMINANT TRANSPORT PATHWAYS TO THE RIVER

The current understanding of the transport mechanism of contaminants from the uplands portions of the Fred Devine Diving and Salvage, Inc. (FDDS) site to the river is summarized in this section and Table 1, and supported in following sections.

1.1. Overland Transport

A portion of the FDDS property northwest of the equipment shed [see Supplemental Figure 4 from EEM (2003)] drains to the riprap-covered bank through overland flow. This area is part of the unpaved yard historically used for storage of ASTs. Samples of soil under the gravel surface contained oil-range hydrocarbons and detectable concentrations of bis(2-ethylhexyl)phthalate and metals. The source of these constituents is not known, although DEQ (2002) indicates that dark staining of soil in this area is present in a 1986 aerial photo prior to the area being covered with gravel. The current potential for overland sheet flow from unpaved areas at the site is not considered significant (DEQ 2003, pers. comm.).

1.2. Riverbank Erosion

The riverbank at the facility is armored with riprap (EEM 2001). No data are available to show that riverbank erosion is occurring or if the underlying soils are contaminated.

1.3. Groundwater

Groundwater data have not been collected at the site. Although a soil sample was described as having oil-range hydrocarbons requiring dilution prior to analysis (see Section 10.1.1), DEQ has determined that the groundwater pathway from the uplands of the site to the Willamette River is not a pathway of concern (DEQ 2002 and 2005, pers. comm.).

1.4. Direct Discharge (Overwater Activities and Stormwater/Wastewater Systems)

Overwater activities take place at the facility dock in the Swan Island Lagoon. Two documented minor spill incidences have occurred since 1995 (see Section 8.3).

The site is drained by six stormwater catch basins that discharge to the Swan Island Lagoon through City Outfall M-1. Samples of catch basin solids obtained at the sites contained detected concentrations of metals and SVOCs that have also been detected in nearby river sediment samples. The analytical results of some SVOCs in site catch basin solids samples are inconclusive due to elevated detection levels. Concentrations of PAHs, bis(2-ethylhexyl)phthalate, arsenic, copper, and zinc have exceeded DEQ Level II Screening Level Values (SLVs) for sediment in certain catch basin solids and river sediment samples (EEM 2003; DEQ 2003, pers. comm.).

1.5. Relationship of Upland Sources to River Sediments

See Final CSM Update.

1.6. Sediment Transport

The FDDS facility is located on the east bank of Swan Island Lagoon at approximately RM 8. The off-channel lagoon was included in the large depositional zone located where the river widens between RM 7 and 10 (Integral et al. 2004). The Sediment Trend Analysis® results suggest that the nearshore area along the east bank experiences both net accretion and net erosion episodically while the other areas of the lagoon are depositional. Time-series bathymetric change data over the 25-month period from January 2002 through February 2004 (Integral and DEA 2004) show nearshore areas of no elevation change inshore of the docks and areas of net erosion outside and adjacent to the docks extending out to about the -25 ft contour. This may reflect sediment scour due to vessel propwash. Beyond the -25 ft contour, there was generally no change in elevation. Finally, periodic monitoring of beach sediment stakes placed at the adjacent Coast Guard station at +7, +9, and +13 feet NAVD88 experienced only small-scale elevation changes (< 5 cm) between July 2002 and January 2004 (Anchor 2004). The low and high stakes showed net accretion, while small-scale net erosion was observed the mid-level beach stake.

2. CSM SITE SUMMARY REVISIONS

Date of Last Revision: April 14, 2005

3. PROJECT STATUS

Activity		Date(s)/Comments
PA/XPA	☒	RI recommended by DEQ in 1999, subsequently downgraded to XPA. PA performed in 2001, soil and catch basin sampling performed in 2002.
RI	☐	
FS	☐	
Interim Action/Source Control	☐	
ROD	☐	
RD/RA	☐	
NFA	☐	

DEQ Portland Harbor Site Ranking (Tier 1, 2, or 3): Tier 3

4. SITE OWNER HISTORY

Primary sources: Multnomah County Assessment & Taxation; USACE Port Series reports, hydrographic maps and aerial photographs; NARA historic records; EEM 2001; DEQ 2004

Owner/Occupant	Type of Operation	Years
The Marine Salvage Consortium, Inc. **(owner)**		1993 - present
Fred Devine Diving and Salvage, Inc. **(owner/operator)**	Moorage for company-owned floating equipment	1973 - present
Smith Environmental Services **(lessee)**	Industrial washing (offsite), hazardous waste profiling, transformation and disposal	1995 - 1996
Pacific Coast Environmental **(lessee)**	Industrial washing (offsite), used site for administration and storage	1989 - 1995
Foss Environmental **(lessee)**	Moorage for company-owned floating equipment	1975 - ?
Portland Steam Navigation Co. **(lessee)**	Rented dock moorage (commercial excursion vessel, *Portland Rose*) and office space	unknown
Frank Russell, Frank Kiermen, F.W. Leadbetter and Percy Blyth **(owner)**		1910 - ?
Portland Trust & Savings Bank **(owner)**		Mid-1940s - ?
Multnomah County **(owner)**		Mid-1940s - ?
U.S. Navy **(operator)**	Waterfront structures owned by Navy and subleased to Kaiser as well as used by Navy	Mid-1940s to 1945
Kaiser Company **(lessee)**	Employee parking lot and waterfront used as outfitting basin	Mid-1940s to 1945

5. PROPERTY DESCRIPTION

The FDDS property occupies 5.74 acres fronting the Swan Island Lagoon at RM 8 of the Willamette River (Figure 1). The site is bordered to the north by a United Parcel Service facility, to the east by North Ensign Street and the Port of Portland Navigation Division facility, on the south by the Swan Island Lagoon, and on the west by a U.S. government property utilized by the Navy and Marine Corp for training and operations (Figure 1; EEM 2001). Most of the site is paved with asphalt or covered by facility buildings. The northern portion of the property (used for storage) is covered with gravel, and the bank along the lagoon is armored by riprap (EEM 2001, 2003). The site elevation is approximately 20 feet above msl, and the topography is relatively flat except for the riverbank slope. Site stormwater drains to six catch basins located in the asphalt-paved portions of the site, and discharges to the City stormwater Outfall M-1, located adjacent to the southeastern corner of the property (EEM 2001).

FDDS facilities include a 7,000-square-foot, two-story office structure built in 1973, a 14,000-square-foot warehouse built in 1976, a 10,500-square-foot warehouse addition built in 1995, and open storage areas (some of which are rented out to other parties), and a dock that was built in 1984 [see Supplemental Figure 4 from EEM (2001)]. Two pad-mounted transformers owned by Portland General Electric (PGE) were noted on the property in 2001, one of which was labeled with a sticker that indicated it does not contain PCBs (EEM 2001; M&ET 1992).

Information regarding the lease of submerged lands and/or overwater structures was not found in Oregon Division of State Lands (DSL) files.

6. CURRENT SITE USE

FDDS is the primary tenant at the site, specializing in marine salvage, wreck removal, high-capacity and heavy oil pumping, underwater inspections and repair, environmental dredging and sampling, and receiving and delivery of ship stores (FDDS 2004).

The warehouse is used predominantly for the storage and maintenance of small boats and diving gear. A small (50-gallon) parts washer and small quantities of motor fuel, lubricating oil, and paint are stored in the eastern warehouse. Safety Kleen services the parts washer, and no indications of spills from the unit have been noted. Additional details regarding maintenance practices or the types of solvents used were not provided in the Preliminary Assessment (PA; EEM 2001). A floor drain, which was previously piped to an oil/water separator (OWS), is located in the floor of the warehouse in front of the paint room. The floor drain was reportedly plugged several years prior to the 2001 PA. The OWS is an underground steel unit with an approximate 400-gallon capacity, which was installed in 1977. A second floor drain is located inside the paint room of the warehouse. This floor drain is plumbed to the OWS, which in turn is plumbed to the sanitary sewer system. The discharge line has reportedly always been kept closed by a valve. The OWS is pumped out and cleaned at least once a year by an outside contractor (EEM 2001).

Open areas on the property (including a gravel-covered area north of the warehouse) are used for storage of FDDS and other tenants' equipment. Several small-capacity aboveground storage tanks (ASTs) (actual volumes not available) that are used during offsite salvage operations are stored outside the warehouse structure. These tanks are reportedly emptied prior to returning to the property. The materials stored in the tanks were not noted. FDDS is not a RCRA hazardous waste generator (EEM 2001).

The facility dock is primarily used to berth FDDS work boats, barges, and a floating workshop, but also is used by moorage tenants for private vessels. Vessels at the dock are refueled by a small tanker truck. No petroleum products or other materials were observed stored on the dock (EEM 2001).

7. SITE USE HISTORY

In the 1940s, the waterfront structures were leased by the U.S Navy and the Kaiser Company, which used the waterfront as an outfitting basin (and the uplands as an employee parking lot). FDDS has been the primary tenant since 1973. Portions of the office building have been leased to various businesses for sales or administrative purposes since 1973.

Two former tenants at the site were environmental contractors whose services included offsite industrial washing (EEM 2001). From 1989 to 1995, part of the warehouse space was occupied by Pacific Coast Environmental (PCE), which specialized in industrial washing, including tank pumping and cleaning services (EEM 2001). PCE used the property for its business administration, equipment storage, and occasional overnight storage of liquids that originated from USTs and/or wash water from tank-cleaning operations. The fluids were stored in two small ASTs and 55-gallon drums, and were reportedly removed or emptied the next day (M&ET 1992; Floyd Snider McCarthy 2001). Cleaners, solvents, and other chemicals were stored in the warehouse (M&ET 1992). PCE also stored diesel in two ASTs (capacities not available) in the storage yard (Floyd Snider McCarthy 2001). PCE operated as a hazardous waste generator (ORR000000612) until 1995 (DEQ 1999), but reportedly did not store hazardous wastes onsite (M&ET 1992). DEQ received a complaint in March 1995, just prior to PCE going out of business, regarding possible dumping of hazardous materials. DEQ performed a site visit and found "suspicious" disposal procedures, but no violations (DEQ 1999).

From 1995 to 1996, Smith Environmental Services (SES) occupied the newly constructed warehouse addition. SES performed environmental services, including industrial washing, hazardous waste profiling, transportation, and disposal. Containers of hazardous waste from offsite SES operations

were not generally kept onsite (EEM 2001). SES used the warehouse office space for business administration and part of the warehouse interior for equipment storage (EEM 2001). Additional details regarding SES operations at the site are not available.

The site facilities formerly included three USTs: two 2,000-gallon USTs installed in 1975, used to store leaded and unleaded gasoline; and one 4,000-gallon unleaded gasoline UST installed in 1979 (EEM 2001; M&ET 1992). All USTs were removed in April 1993, and, based on reported DEQ decommissioning *Change-In-Service* forms, the tanks had not leaked (EEM 2001; DEQ 1999). Data regarding the City Outfall M-1 indicates three additional former 6,000-gallon USTs were present at the site, located "in front of the property"(Floyd Snider McCarthy 2001). However, no additional information on the three additional USTs is currently available (Floyd Snider McCarthy 2001).

8. CURRENT AND HISTORIC SOURCES AND COPCS

The understanding of the historic and current potential upland and overwater sources at the site is summarized in Table 1. The following sections provide a brief overview of the potential sources and COPCs at the site requiring additional discussion.

8.1. *Uplands*

Potential upland contaminant sources identified at the site include:

- **Current Site Operations.** Maintenance of boats and diving gear is performed in at least one section of the warehouse, which includes a 50-gallon parts washer and small quantities of motor fuel, lubricating oil, and paint (EEM 2001). Details regarding the type of solvents used in the parts washer and the types of paint stored are not available.
- **Historical Site Operations.** Historical operations included those of former tenants PCE and SES. Details regarding all materials handled by these operations are not available, but the handled materials included diesel, solvents, and unknown "cleaners" and "other chemicals" (M&ET 1992).
- **Oil/water Separator.** This unit receives flow from floor drains in the warehouse. Although the outlet is reportedly plugged, possible (unknown) leaks of contaminated fluids from this structure and associated piping would have had the potential to impact subsurface media.
- **Catch Basins.** Six catch basins drain runoff from the paved portions of the site to Outfall M-1 in Swan Island Lagoon. In addition, possible (unknown) leaks of contaminated fluids from the stormwater sewer system would have had the potential to impact subsurface media and sediments.
- **ASTs.** M&ET (1992) reported two diesel ASTs present near the northern corner of the site. The current status of these tanks is not known. Several empty, "small capacity" ASTs were observed stored outside the warehouse in 2001, but the material they usually store was not noted. No active ASTs were observed more recently (EEM 2001).
- **Storage Area NW of Warehouse.** This unpaved area has historically been used for storage by site tenants, possibly including wastes from tank-cleaning operations by PCE.
- **Former USTs.** Three documented USTs containing leaded and unleaded gasoline formerly existed at the site. Soil samples were collected at each location during tank decommissioning. Petroleum hydrocarbons were not detected in any samples based on qualitative laboratory screening scans (TPH-HCID) (EEM 2001). Three additional

former USTs reportedly were present at the site; however, information confirming the existence, location and disposition of these USTs is not available.

- **PGE Transformers.** Two pad-mounted transformers owned by PGE exist at the site (EEM 2001). Only of these units was marked as not containing PCBs.

DEQ determined that the stormwater sewer system and overland drainage were the two most significant contaminant migration pathways at the site (EEM 2003). Soil samples from the unpaved storage area and sediment samples from the stormwater catch basins were requested, and were collected in 2002. The analytical results of these samples are discussed in Sections 10.1 and 10.3 below.

8.2. Overwater Activities

☒ Yes ☐ No

Potential contaminant sources related to overwater activities at the facility dock include:

- **Spills from the Dock.** Materials placed on the dock or transferred from vessels to the dock may fall into Swan Island Lagoon, as documented in Section 8.3 below.
- **Spills from Vessel Fueling Operations.** No spills have been documented.
- **Discharges from Moored Vessels.** Several private vessels moor at the dock in addition to FDDS vessels. No spills from these vessels have been documented.

Information regarding the lease of submerged lands and/or overwater structures was not found in Oregon DSL files.

8.3. Spills

Known or documented spills at the FDDS site were obtained either from DEQ's Emergency Response Information System (ERIS) database for the period of 1995 to 2004, from oil and chemical spills recorded from 1982 to 2003 by the U.S. Coast Guard and the National Response Center's centralized federal database [see Appendix E of the Portland Harbor Work Plan (Integral et al. 2004)], from facility-specific technical reports, or from DEQ correspondence. These spills are summarized below.

Date	Material(s) Released	Volume Spilled (gallons)	Spill Surface (gravel, asphalt, sewer)	Action Taken (yes /no)
6/24/80	Ensign Street outfall sheen	Unknown	Swan Island Lagoon	No
3/10/99	Ensign Street outfall sheen	Unknown	Swan Island Lagoon	No

Two additional small incidents have occurred at the property:

- **Incident report # 282547 (1995):** Absorbent pads used at a PCE job at Swan Island Shipyard fell from a torn bag on the dock into the lagoon, causing a small sheen on the water (no free product).
- **Incident report # 349208 (2000):** a pallet fell from a crane resulting in a release of 5 gallons of paint (unknown type) to the river, which was reportedly quickly cleaned up.

9. PHYSICAL SITE SETTING

9.1. Geology

Available files indicate that no geologic or hydrogeologic data have been collected at the site.

9.2. Hydrogeology

Available files indicate that no geologic or hydrogeologic data have been collected at the site.

10. NATURE AND EXTENT *(Current Understanding)*

The current understanding of the nature and extent of contamination for the uplands portions of the site is summarized in this section. When no data exist for a specific medium, a notation is made.

10.1. Soil

10.1.1. Upland Soil Investigations ☒ Yes ☐ No

At the request of DEQ, soil samples were collected from four locations in the unpaved storage areas on May 1, 2002 [see Supplemental Figure 5 from EEM (2003)]. The samples were collected from the soil layer that was located beneath approximately 6 inches of compacted gravel ground cover, and were analyzed for total arsenic, cadmium, copper, lead, and zinc, SVOCs, and PCBs. Significant oil-range petroleum hydrocarbons noted by the analytical lab in SS#4 required dilution prior to analysis; consequently, detection limits are elevated for SVOCs in this sample. The concentrations of petroleum hydrocarbons in the samples were not quantified. The detected analytes are summarized in the following table (EEM 2003):

Analyte	Min (location)	Max (location)
Arsenic	2.12 mg/kg (#2)	17.9 mg/kg (#1)
Cadmium	1 U mg/kg (#2, #4)	1.45 mg/kg (#1)
Copper	19.7 mg/kg (#2)	98.8 mg/kg (#1)
Lead	3.59 mg/kg (#2)	57.6 mg/kg (#1)
Zinc	47.7 mg/kg (#2)	288 mg/kg (#1)
Bis(2-ethylhexyl)phthalate	0.067 U mg/kg (#2, #3)	0.0817 mg/kg (#1)

mg/kg = milligrams per kilogram (ppm)
U = Not detected at reporting limit

10.1.2. Riverbank Samples ☐ Yes ☒ No

The bank is armored with riprap.

10.1.3. Summary

DEQ (2003) noted that except for arsenic, all detected metals concentrations in the site soil samples are below EPA (Region 9) Preliminary Remediation Goals (PRGs). Bis(2-ethylhexyl)phthalate detected in sample #1 was also detected in stormwater catch basin sediment (see Section 10.3.4 below).

10.2. Groundwater

DEQ has concluded that the groundwater pathway from the uplands to the Willamette River is not a pathway of concern (DEQ 2002, pers. comm.).

10.2.1. Groundwater Investigations ☐ Yes ☒ No

No geologic or hydrogeologic data have been collected at the site.

10.2.2. NAPL (Historic & Current) ☐ Yes ☐ No

No data are available to assess the presence or absence of NAPL.

10.2.3. Dissolved Contaminant Plumes ☐ Yes ☐ No

No data are available to assess the presence or absence of dissolved contaminant plumes.

Plume Characterization Status ☐ Complete ☐ Incomplete

Not applicable (N/A). No geologic or hydrogeologic data have been collected at the site.

Plume Extent

N/A. No geologic or hydrogeologic data have been collected at the site.

Min/Max Detections

N/A. No geologic or hydrogeologic data have been collected at the site.

Current Plume Data

N/A. No geologic or hydrogeologic data have been collected at the site.

Preferential Pathways

N/A. No geologic or hydrogeologic data have been collected at the site.

Downgradient Plume Monitoring Points (min/max detections)

N/A. No geologic or hydrogeologic data have been collected at the site.

Visual Seep Sample Data ☐ Yes ☒ No

No data are available.

Nearshore Porewater Data

No nearshore porewater data are available.

Groundwater Plume Temporal Trend

No groundwater data are available.

10.2.4. Summary

No hydrogeologic or groundwater quality data have been collected at the site. DEQ (2002, pers. comm.) has determined that groundwater is not a pathway of concern.

10.3. Surface Water

10.3.1. Surface Water Investigation ☐ Yes ☒ No

10.3.2. General or Individual Stormwater Permit (Current or Past)
☐ Yes ☒ No

Do other non-stormwater wastes discharge to the system? ☒ Yes ☐ No

Equipment wash water generated at the facility may enter site stormwater catch basins (see Section 10.3.3 below).

10.3.3. Stormwater Data ☒ Yes ☐ No

On February 21, 2001, the City of Portland Bureau of Environmental Services (BES) sampled stormwater from the downstream catch basin on FDSS property to determine if an NPDES permit was warranted for the FDDS facility. The analytical results indicated no petroleum contaminants were detected and only pH was out of the range of NPDES parameter limits, possibly due to equipment washing activities. Based on this finding, BES decided against requesting DEQ issue an NPDES permit to the facility (EEM 2001).

10.3.4. Catch Basin Solids Data ☒ Yes ☐ No

At the request of DEQ, solids samples were collected from catch basins #1, #3, #4, and #6 on April 30, 2002, as shown on Supplemental Figure 5 from EEM (2003). The samples were analyzed for total arsenic, cadmium, copper, lead, and zinc, SVOCs, and PCBs. The lab noted significant oil-range petroleum hydrocarbons in each of the catch basin samples. Therefore, dilution was required prior to analysis, and consequently, detection limits were elevated for some of these results, including for undetected phthalates. The detected analytes are summarized in the following table:

Analyte	Min (location)	Max (location)
Arsenic	2.71 mg/kg (#6)	16.7 mg/kg (#1)
Cadmium	1 U mg/kg (#6)	3.47 mg/kg (#4)
Copper	85.5 mg/kg (#6)	206 mg/kg (#1)
Lead	66.6 mg/kg (#6)	283 mg/kg (#4)
Zinc	236 mg/kg (#6)	488 mg/kg (#4)
Anthracene	6.7 U mg/kg (#1, #3, #6)	16.7 mg/kg (#4)
Bis(2-ethylhexyl)phthalate	6.7 U mg/kg (#6)	172 mg/kg (#3)
Butyl benzyl phthalate	6.7 U mg/kg (#1, #3, #6)	27.2 mg/kg (#4)
Fluoranthene	6.7 U mg/kg (# 1, #6)	18.7 mg/kg (#4)
Phenanthrene	6.7 U mg/kg (# 1, #6)	20 mg/kg (#4)
Pyrene	6.7 U mg/kg (# 1, #6)	12.5 mg/kg (#4)
PCBs	0.500 U mg/kg	0.500 U mg/kg

mg/kg = milligrams per kilogram (ppm)
U = Not detected at reporting limit.

10.3.5. Wastewater Permit

☐ Yes ☒ No

10.3.6. Wastewater Data

☐ Yes ☒ No

10.3.7. Summary

The phthalates [bis(2-ethylhexyl)phthalate and butyl benzyl phthalate] detected in the catch basin sediment are of concern to DEQ because sediment samples collected from Swan Island Lagoon near the discharge point of City Outfall M-1 contained phthalate concentrations that are elevated relative to other river sediments (DEQ 2003, pers. comm.). The analytical results of other, undetected phthalates are inconclusive due to elevated detection limits (6.7 mg/kg) resulting from matrix interferences in the catch basin samples (EEM 2003). All the detected metals concentrations in catch basin sediment (except arsenic in #1 and #6) exceeded DEQ SLVs for sediment (EEM 2003). One or more detected PAHs in sediments from catch basins #3 and #4 also exceeded DEQ SLVs. (However, reporting limits for undetected PAHs were higher than the SLVs in sediment from all catch basins). DEQ has concluded that paint-related waste appears to be a possible source of contamination to the catch basin (DEQ 2003, pers. comm.).

10.4. Sediment

10.4.1. River Sediment Data

☒ Yes ☐ No

Nine surface sediment samples and one core sample have been collected at the FDDS property in association with the following four surveys (Figure 1):

Survey	Survey Code	Year
Portland Shipyard Sediment Investigation (SEA 1998)	PSYSEA98	1998
City of Portland Outfall Pilot Project (CH2M Hill 2002)	WLCOFH02	2002
Portland Harbor Sediment Investigation (Weston 1998)	WR-WSI98	1998
Portland Harbor RI/FS Round 1 (Integral 2004)	LWG01	2001

The core sample (SD 136) was collected during the 1998 Portland Harbor Sediment Investigation (Weston 1998) and consisted of the 0-90 cm interval (Figure 1).

The samples were analyzed for various constituents including metals, TPH, VOCs, SVOCs, PAHs, phenols, phthalates, PCB Aroclors, pesticides, herbicides, and grainsize distribution (Table 2).

10.4.2. Summary

See Final CSM Update.

11. CLEANUP HISTORY AND SOURCE CONTROL MEASURES

11.1. Soil Cleanup/Source Control

As mentioned in Section 7, three former USTs were removed from the site in 1993. No soil or groundwater samples were collected.

11.2. Groundwater Cleanup/Source Control

Available records indicate that no groundwater cleanup or source control activities have been conducted at the site.

11.3. Other

As noted above, the OWS is pumped out and cleaned at least once a year; the materials removed are disposed of through an outside contractor. Catch basin cleaning is performed at least twice a year: prior to the beginning of the rainy season, and again in mid-winter or early spring (EEM 2003).

11.4. Potential For Recontamination from Upland Sources

See Final CSM Update.

12. BIBLIOGRAPHY / INFORMATION SOURCES

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Figures:

Figure 1. Site Features

Tables:

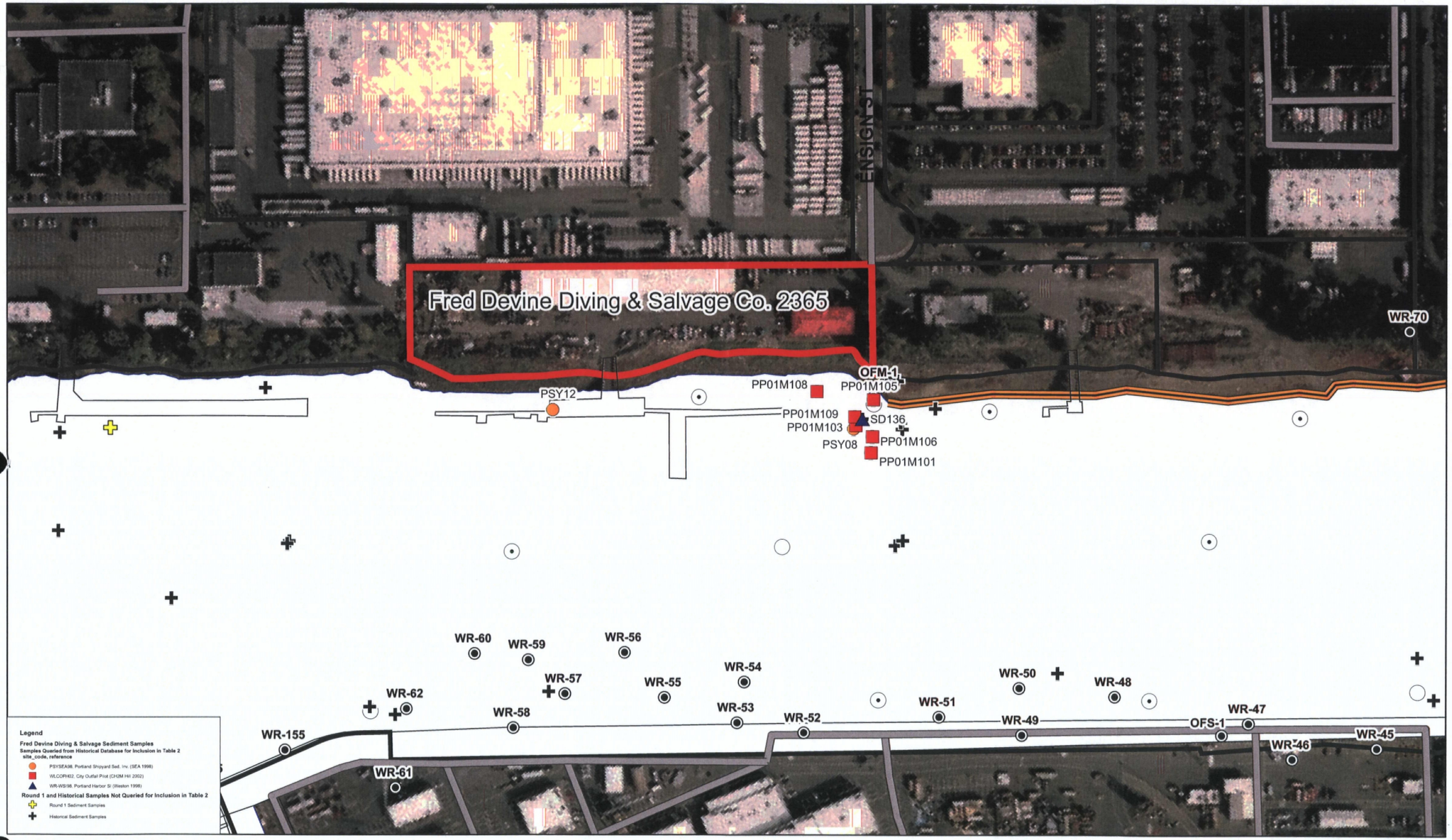
Table 1. Potential Sources
Table 2. Queried Sediment Chemistry Data

Supplemental Figures:

Figure 4. Site Diagram (EEM 2001)
Figure 5. Sample Locations (EEM 2003)

FIGURES

Figure 1. Site Features



integral consulting inc.

LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\Conseptual_Site_Model\Sample_Locations.mxd)
Plot Date: 03/18/2005

Areal Photo Date: October 2001.
Base Map features from Portland Metro's RLIS.

Outfall information contained on this map is accurate according to available records; however, the City of Portland makes no warranty, expressed or implied, as to the completeness or accuracy of the information published (updated March 2005).

Legend

- Outfalls
- Seep Photo Location (Not location of actual Seep)
- Selected ECSI Site Property Boundary
- Navigation Channel
- Docks & In-water Structures
- River Miles
- -35ft. Contour (NAVD 88)

Human Use Areas

- Dockside Worker
- Recreational Beach Use
- Transient

LWG Round 2 Proposed Sediment Samples

- Surface Sample Only
- Core & Surface Sample

0 100 200 400 Feet

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Figure 1-Site Features
Portland Harbor RI/FS
Conceptual Site Model
Fred Devine Diving and Salvage
ECSI 2365

TABLES

Fred Devine Diving and Salvage, Inc. #2365

Table 1. Potential Sources and Transport Pathways Assessment

Potential Sources		Media Impacted					COIs																Potential Complete Pathway				
							TPH			VOCs																		
	Description of Potential Source	Surface Soil	Subsurface Soil	Groundwater	Catch Basin Solids	River Sediment	Gasoline-Range	Diesel - Range	Heavier - Range	Petroleum-Related (e.g. BTEX)	VOCs	Chlorinated VOCs	SVOCs	PAHs	Phthalates	Phenolics	Metals	PCBs	Herbicides and Pesticides	Dioxins/Furans	Butyltins	Overland Transport	Groundwater	Direct Discharge - Overwater	Direct Discharge - Storm/Wastewater	River Bank Erosion
Upland Areas																											
	Maintenance operations (warehouse)	?	?		?	?	?	?	?	?	?	?	?	?	?	?	?				✓	?			?	
	Oil/water separators		?					✓	✓	✓	✓	✓	✓	✓	✓	?	✓									
	PGE transformers	?	?			?												✓							?	
	Former USTs		?	?		?	✓	✓	✓	✓													?			
	Catch basins		?		✓	?			✓				✓	✓	✓	?	✓								✓	
	ASTs	?	?	?	?	?	?	✓	?	?	?	?	?	?	?		?					?			?	
	Storage area NW of warehouse	✓	?	?	?	?			✓				?	?	✓	?	✓					?			?	
Overwater Areas																											
	Spills from dock and vessel fueling operations					?		✓	✓				✓	✓	✓		✓							✓		
	Vessel emissions and/or discharges (unknown)					?	?	?	?	?	?	?	?	?	?		✓							?		
Other Areas/Other Issues																											

Notes:

All information provided in this table is referenced in the site summaries. If information is not available or inconclusive, a ? may be used, as appropriate. No new information is provided in this table.

✓ = Source, COI are present or current or historic pathway is determined to be complete or potentially complete.

? = There is not enough information to determine if source or COI is present or if pathway is complete.

Blank = Source, COI and historic and current pathways have been investigated and shown to be not present or incomplete.

UST	Underground storage tank
AST	Above-ground storage tank
TPH	Total petroleum hydrocarbons
VOCs	Volatile organic compounds
SVOCs	Semivolatile organic compounds
PAHs	Polycyclic aromatic hydrocarbons
BTEX	Benzene, toluene, ethylbenzene, and xylenes
PCBs	Polychorinated biphenols

Table 2. Queried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	Aroclor 1016 (ug/kg)	8	1	12.5	46	46	46	46	46	6.59 U	46	13	7.7 U	10 U
surface	Aroclor 1242 (ug/kg)	8	1	12.5	28.7	28.7	28.7	28.7	28.7	3.14 U	28.7	8.32	3.67 U	10 U
surface	Aroclor 1248 (ug/kg)	8	3	37.5	39.9	78.5	53.4	41.7	41.7	2.33 U	78.5	23.5	10 U	41.7
surface	Aroclor 1254 (ug/kg)	8	7	87.5	19.7	156	63.8	59.5	78.7	2.26 U	156	56.1	37	78.7
surface	Aroclor 1260 (ug/kg)	8	8	100	13.5	135	59.8	53	91.2	13.5	135	59.8	53	91.2
surface	Aroclor 1262 (ug/kg)	6	0	0						3.48 U	4.62 U	3.96	3.92 U	4.07 U
surface	Aroclor 1268 (ug/kg)	6	0	0						3.48 U	4.62 U	3.96	3.92 U	4.07 U
surface	Aroclor 1221 (ug/kg)	8	0	0						2.51 U	10 U	4.64	2.9 U	10 U
surface	Aroclor 1232 (ug/kg)	8	0	0						4.27 U	10 U	6.14	4.92 U	10 U
surface	Polychlorinated biphenyls (ug/kg)	8	8	100	13.5 A	338.2 A	145	121 A	209 A	13.5 A	338.2 A	145	121 A	209 A
surface	Total solids (percent)	2	2	100	49.1	64.8	57	49.1	49.1	49.1	64.8	57	49.1	49.1
surface	Total organic carbon (percent)	9	9	100	0.315	3.8	1.58	1.5	2.03	0.315	3.8	1.58	1.5	2.03
surface	Acid Volatile Sulfides (mg/kg)	2	2	100	2.4	9.4	5.9	2.4	2.4	2.4	9.4	5.9	2.4	2.4
surface	Total volatile solids (percent)	2	2	100	2.94	7.19	5.07	2.94	2.94	2.94	7.19	5.07	2.94	2.94
surface	Ammonia (mg/l)	2	2	100	0.59	2.91	1.75	0.59	0.59	0.59	2.91	1.75	0.59	0.59
surface	Gravel (percent)	3	3	100	0.28	4.5	1.92	0.97	0.97	0.28	4.5	1.92	0.97	0.97
surface	Sand (percent)	3	3	100	68.23	92.07 E	80	79.8	79.8	68.23	92.07 E	80	79.8	79.8
surface	Fines (percent)	1	1	100	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7
surface	Silt (percent)	3	3	100	7.9	27.9	16.9	14.96	14.96	7.9	27.9	16.9	14.96	14.96
surface	Clay (percent)	3	3	100	0.74	3.5	2.11	2.1	2.1	0.74	3.5	2.11	2.1	2.1
surface	Dalapon (ug/kg)	6	0	0						0.152 U	0.197 U	0.171	0.16 U	0.185 U
surface	Dicamba (ug/kg)	6	0	0						0.155 U	0.201 U	0.175	0.164 U	0.189 U
surface	MCPA (ug/kg)	6	0	0						0.297 U	0.384 U	0.335	0.313 U	0.361 U
surface	Dichloroprop (ug/kg)	6	0	0						0.25 U	0.324 U	0.282	0.264 U	0.304 U
surface	2,4-D (ug/kg)	6	0	0						0.263 U	0.341 U	0.297	0.277 U	0.32 U
surface	Silvex (ug/kg)	6	0	0						0.253 U	0.328 U	0.286	0.267 U	0.308 U
surface	2,4,5-T (ug/kg)	6	0	0						0.31 U	0.401 U	0.349	0.326 U	0.377 U
surface	2,4-DB (ug/kg)	6	0	0						0.19 U	0.245 U	0.214	0.2 U	0.231 U
surface	Dinoseb (ug/kg)	6	0	0						0.217 U	0.281 U	0.245	0.229 U	0.264 U
surface	MCPP (ug/kg)	6	0	0						0.132 U	0.171 U	0.149	0.139 U	0.161 U
surface	Aluminum (mg/kg)	7	7	100	3560	15400	8760	8120	12000	3560	15400	8760	8120	12000
surface	Antimony (mg/kg)	9	8	88.9	0.1 G	1.83 J	0.902	0.6 G	1.33 J	0.1 G	7 UJ	1.58	1.15 J	1.83 J
surface	Arsenic (mg/kg)	9	8	88.9	4.1	17	7.31	5.81	8.98	4.1	17	7.27	6	8.98
surface	Cadmium (mg/kg)	9	8	88.9	0.4	2.3	1.29	1.26	1.89	0.00947 U	2.3	1.14	1.26	1.89
surface	Chromium (mg/kg)	9	9	100	17	89.2	38.2	34.7	45	17	89.2	38.2	34.7	45
surface	Copper (mg/kg)	9	9	100	34.4 B	119	74.5	79.9 B	86.5 B	34.4 B	119	74.5	79.9 B	86.5 B
surface	Lead (mg/kg)	9	9	100	14.6 B	57.6 B	35.5	38.6 B	48.2 B	14.6 B	57.6 B	35.5	38.6 B	48.2 B
surface	Manganese (mg/kg)	1	1	100	323	323	323	323	323	323	323	323	323	323
surface	Mercury (mg/kg)	9	5	55.6	0.06	0.14	0.113	0.125	0.131	0.0102 U	0.14	0.072	0.06	0.131
surface	Nickel (mg/kg)	9	9	100	14.6 B	25	19.8	20	23.6 B	14.6 B	25	19.8	20	23.6 B
surface	Selenium (mg/kg)	7	1	14.3	10	10	10	10	10	0.498 U	10	1.9	0.574 U	0.603 U
surface	Silver (mg/kg)	9	9	100	0.0654 J	0.9	0.242	0.2	0.249 J	0.0654 J	0.9	0.242	0.2	0.249 J
surface	Thallium (mg/kg)	1	0	0						7 U	7 U	7	7 U	7 U
surface	Zinc (mg/kg)	9	9	100	145 B	403 B	284	318 B	362 B	145 B	403 B	284	318 B	362 B
surface	Barium (mg/kg)	1	1	100	138	138	138	138	138	138	138	138	138	138

Table 2. Queried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations					Detected and Nondetected Concentrations				
					Minimum	Maximum	Mean	Median	95th	Minimum	Maximum	Mean	Median	95th
surface	Beryllium (mg/kg)	1	1	100	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
surface	Calcium (mg/kg)	1	1	100	6310 J	6310 J	6310	6310 J	6310 J	6310 J	6310 J	6310	6310 J	6310 J
surface	Cobalt (mg/kg)	1	1	100	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5
surface	Iron (mg/kg)	1	1	100	37900	37900	37900	37900	37900	37900	37900	37900	37900	37900
surface	Magnesium (mg/kg)	1	1	100	4090	4090	4090	4090	4090	4090	4090	4090	4090	4090
surface	Potassium (mg/kg)	1	1	100	570	570	570	570	570	570	570	570	570	570
surface	Sodium (mg/kg)	1	1	100	763	763	763	763	763	763	763	763	763	763
surface	Vanadium (mg/kg)	1	1	100	68.6	68.6	68.6	68.6	68.6	68.6	68.6	68.6	68.6	68.6
surface	2-Methylnaphthalene (ug/kg)	9	4	44.4	9.42 J	20	14.5	13	15.4 J	9.42 J	35.1 UJ	22.1	20	32.3 UJ
surface	Acenaphthene (ug/kg)	9	5	55.6	20.2	108 J	50	26.7	72	19 U	111 UJ	62.9	72	108 J
surface	Acenaphthylene (ug/kg)	9	4	44.4	13	88	35.2	18.6 J	21.3	13	98 UJ	55.6	74.3 UJ	90.2 UJ
surface	Anthracene (ug/kg)	9	8	88.9	17.3 J	429	108	52	137 J	17.3 J	429	102	56.6 UJ	137 J
surface	Fluorene (ug/kg)	9	7	77.8	22.4	130 J	81	103 J	129 J	19 U	130 J	73.9	79.6 UJ	129 J
surface	Naphthalene (ug/kg)	9	4	44.4	14.4 J	34	23.7	19.2 J	27	14.4 J	105 UJ	53.2	34	96.8 UJ
surface	Phenanthrene (ug/kg)	9	9	100	93.9	1720	432	313	425 J	93.9	1720	432	313	425 J
surface	Low Molecular Weight PAH (ug/kg)	9	9	100	129 A	2467 A	644	433 A	744 A	129 A	2467 A	644	433 A	744 A
surface	Dibenz(a,h)anthracene (ug/kg)	9	2	22.2	31	125	78	31	31	4.4 U	125	40.6	39.7 UJ	52.4 UJ
surface	Benz(a)anthracene (ug/kg)	9	6	66.7	69	1480	407	150	308 J	69	1480	313	148	308 J
surface	Benzo(a)pyrene (ug/kg)	9	5	55.6	85	1630	438	136	223	85	1630	294	121 UJ	223
surface	Benzo(b)fluoranthene (ug/kg)	3	3	100	110	1150	537	350	350	110	1150	537	350	350
surface	Benzo(g,h,i)perylene (ug/kg)	9	5	55.6	49	854	260	130	164	28.1 UJ	854	159	49	164
surface	Benzo(k)fluoranthene (ug/kg)	3	3	100	74	1120	487	267	267	74	1120	487	267	267
surface	Chrysene (ug/kg)	9	7	77.8	130	2140	559	430	469 J	121 UJ	2140	463	160	469 J
surface	Fluoranthene (ug/kg)	9	9	100	220	3600	902	674	877 J	220	3600	902	674	877 J
surface	Indeno(1,2,3-cd)pyrene (ug/kg)	9	5	55.6	48	889	259	126	155	39.7 UJ	889	164	52.4 UJ	155
surface	Pyrene (ug/kg)	9	9	100	208	4280	934	599 J	834 J	208	4280	934	599 J	834 J
surface	Benzo(b+k)fluoranthene (ug/kg)	9	7	77.8	184 A	2270 A	694	581 J	716 J	78.4 UJ	2270 A	560	262	716 J
surface	High Molecular Weight PAH (ug/kg)	9	9	100	926 A	17268 A	3630	2115 A	3282 A	926 A	17268 A	3630	2115 A	3282 A
surface	Polycyclic Aromatic Hydrocarbons (ug/kg)	9	9	100	1154 A	19735 A	4280	2830 A	3712 A	1154 A	19735 A	4280	2830 A	3712 A
surface	2,4'-DDD (ug/kg)	6	0	0						4.9 U	6.59 U	5.95	5.93 U	6.58 U
surface	2,4'-DDE (ug/kg)	6	0	0						4.9 U	6.59 U	5.95	5.93 U	6.58 U
surface	2,4'-DDT (ug/kg)	6	0	0						4.9 U	6.59 U	5.95	5.93 U	6.58 U
surface	4,4'-DDD (ug/kg)	8	2	25	2.49 J	4.04 JP	3.27	2.49 J	2.49 J	0.477 U	4.04 JP	1.59	0.578 U	2.49 J
surface	4,4'-DDE (ug/kg)	8	5	62.5	1.03 JP	4	1.96	1.83 JP	1.9 JP	0.564 U	4	1.63	1.06 JP	2 U
surface	4,4'-DDT (ug/kg)	8	1	12.5	7	7	7	7	7	0.635 U	7	1.7	0.77 U	2 U
surface	Total of 3 isomers: pp-DDT,-DDD,-DDE (ug/kg)	8	5	62.5	1.03 A	11 A	4.67	4.39 A	5.87 A	0.635 UA	11 A	3.34	1.06 A	5.87 A
surface	Aldrin (ug/kg)	8	0	0						1.06 U	6 U	1.96	1.28 U	2 U
surface	alpha-Hexachlorocyclohexane (ug/kg)	8	0	0						0.762 U	2 U	1.19	0.923 U	2 U
surface	beta-Hexachlorocyclohexane (ug/kg)	8	0	0						1.04 U	2 U	1.44	1.26 U	2 U
surface	delta-Hexachlorocyclohexane (ug/kg)	8	0	0						0.941 U	2 U	1.36	1.14 U	2 U
surface	gamma-Hexachlorocyclohexane (ug/kg)	8	0	0						0.937 U	6 U	1.85	1.14 U	2 U
surface	cis-Chlordane (ug/kg)	8	1	12.5	1.57 J	1.57 J	1.57	1.57 J	1.57 J	0.975 U	2 U	1.44	1.31 U	2 U
surface	trans-Chlordane (ug/kg)	6	3	50	1.99 JP	2.3 JP	2.13	2.11 JP	2.11 JP	0.996 U	2.3 JP	1.63	1.2 U	2.11 JP
surface	Oxychlordane (ug/kg)	6	0	0						4.9 U	6.59 U	5.95	5.93 U	6.58 U
surface	cis-Nonachlor (ug/kg)	6	0	0						4.9 U	6.59 U	5.95	5.93 U	6.58 U

Table 2. Queried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	trans-Nonachlor (ug/kg)	6	0	0						4.9 U	6.59 U	5.95	5.93 U	6.58 U
surface	Dieldrin (ug/kg)	8	1	12.5	6	6	6	6	6	0.804 U	6	1.73	0.974 U	2 U
surface	alpha-Endosulfan (ug/kg)	8	0	0						1.04 U	2 U	1.45	1.26 U	2 U
surface	beta-Endosulfan (ug/kg)	8	0	0						0.948 U	2 U	1.36	1.15 U	2 U
surface	Endosulfan sulfate (ug/kg)	8	1	12.5	4	4	4	4	4	0.892 U	4	1.56	1.08 U	2 U
surface	Endrin (ug/kg)	8	0	0						0.885 U	6 U	1.81	1.07 U	2 U
surface	Endrin aldehyde (ug/kg)	8	1	12.5	4	4	4	4	4	1 U	4	1.66	1.21 U	2 U
surface	Endrin ketone (ug/kg)	8	0	0						0.689 U	2 U	1.13	0.835 U	2 U
surface	Heptachlor (ug/kg)	8	0	0						0.844 UJ	6 U	1.77	1.02 UJ	2 U
surface	Heptachlor epoxide (ug/kg)	8	0	0						0.896 U	2 U	1.32	1.09 U	2 U
surface	Methoxychlor (ug/kg)	8	0	0						3.38 U	4.54 U	4.08	4 U	4.53 U
surface	Toxaphene (ug/kg)	8	0	0						15.4 U	30 U	21.5	18.6 U	30 U
surface	gamma-Chlordane (ug/kg)	2	1	50	7	7	7	7	7	3 UB	7	5	3 UB	3 UB
surface	Chlordane (cis & trans) (ug/kg)	6	0	0						3.45 U	4.64 U	4.19	4.17 U	4.63 U
surface	Pyridine (ug/kg)	1	0	0						382 UJ	382 UJ	382	382 UJ	382 UJ
surface	Diesel fuels (mg/kg)	6	6	100	44.1 V	777 V	362	261 V	541 V	44.1 V	777 V	362	261 V	541 V
surface	Lube Oil (mg/kg)	6	6	100	150	2110	1080	871	1800	150	2110	1080	871	1800
surface	Tetrachlorophenol (ug/kg)	6	0	0						35.7 U	425 UJ	258	322 UJ	391 UJ
surface	2,4,5-Trichlorophenol (ug/kg)	9	0	0						34 U	405 UJ	183	96 U	372 UJ
surface	2,4,6-Trichlorophenol (ug/kg)	9	0	0						25.1 U	299 UJ	138	96 U	275 UJ
surface	2,4-Dichlorophenol (ug/kg)	9	0	0						20.8 U	247 UJ	129	100 U	228 UJ
surface	2,4-Dimethylphenol (ug/kg)	9	0	0						19 U	247 UJ	107	21.7 U	228 UJ
surface	2,4-Dinitrophenol (ug/kg)	9	0	0						45.3 U	539 UJ	306	300 U	497 UJ
surface	2-Chlorophenol (ug/kg)	9	0	0						19 U	337 UJ	150	50 U	310 UJ
surface	2-Methylphenol (ug/kg)	9	0	0						19 U	270 UJ	134	100 U	248 UJ
surface	2-Nitrophenol (ug/kg)	9	0	0						26.4 U	315 UJ	147	96 U	290 UJ
surface	4,6-Dinitro-2-methylphenol (ug/kg)	9	0	0						69.9 U	832 UJ	380	190 U	766 UJ
surface	4-Chloro-3-methylphenol (ug/kg)	9	1	11.1	29.8 J	29.8 J	29.8	29.8 J	29.8 J	20.8 U	247 UJ	116	50 U	228 UJ
surface	4-Methylphenol (ug/kg)	9	2	22.2	68 J	380	224	68 J	68 J	28 U	380	203	252 UJ	333 UJ
surface	4-Nitrophenol (ug/kg)	9	0	0						0.151 U	100 U	33	0.183 U	100 U
surface	Pentachlorophenol (ug/kg)	9	3	33.3	3.49	7	5.47	5.92	5.92	0.194 U	100 U	34.8	5.92	100 U
surface	Phenol (ug/kg)	9	1	11.1	163	163	163	163	163	19 U	450 UJ	208	163	414 UJ
surface	Dimethyl phthalate (ug/kg)	9	2	22.2	19 J	42	30.5	19 J	19 J	10 U	247 UJ	108	42	228 UJ
surface	Diethyl phthalate (ug/kg)	9	0	0						10 U	382 UJ	159	33.5 U	352 UJ
surface	Dibutyl phthalate (ug/kg)	9	1	11.1	71	71	71	71	71	10 U	1960 UJ	803	171 U	1800 UJ
surface	Butylbenzyl phthalate (ug/kg)	9	5	55.6	54.7 J	2010 J	551	223	407	10 U	2010 J	429	324 UJ	427 UJ
surface	Di-n-octyl phthalate (ug/kg)	9	6	66.7	13	30100 J	5360	256	1050 J	13	30100 J	3630	256	1050 J
surface	Bis(2-ethylhexyl) phthalate (ug/kg)	9	9	100	226	39200 J	9730	2250 J	32500 J	226	39200 J	9730	2250 J	32500 J
surface	Bis(2-chloro-1-methylethyl) ether (ug/kg)	1	0	0						19 UJ	19 UJ	19	19 UJ	19 UJ
surface	2,4-Dinitrotoluene (ug/kg)	7	0	0						24.6 U	292 UJ	166	222 UJ	269 UJ
surface	2,6-Dinitrotoluene (ug/kg)	7	0	0						34 U	405 UJ	224	307 UJ	372 UJ
surface	2-Chloronaphthalene (ug/kg)	7	0	0						5.67 U	67.4 UJ	37.8	51.1 UJ	62.1 UJ
surface	2-Nitroaniline (ug/kg)	7	0	0						24.6 U	292 UJ	166	222 UJ	269 UJ
surface	3,3'-Dichlorobenzidine (ug/kg)	7	0	0						20.8 U	247 UJ	143	188 UJ	228 UJ
surface	3-Nitroaniline (ug/kg)	7	1	14.3	475 J	475 J	475	475 J	475 J	32.1 U	475 J	234	290 UJ	382 UJ

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Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
surface	4-Bromophenyl phenyl ether (ug/kg)	7	0	0						19 U	299 UJ	158	227 UJ	275 UJ
surface	4-Chloroaniline (ug/kg)	7	0	0						17.6 U	209 UJ	117	159 UJ	192 UJ
surface	4-Chlorophenyl phenyl ether (ug/kg)	7	0	0						19 U	378 UJ	199	286 UJ	348 UJ
surface	4-Nitroaniline (ug/kg)	7	0	0						32.1 U	382 UJ	213	290 UJ	352 UJ
surface	Aniline (ug/kg)	6	1	16.7	94.4 J	94.4 J	94.4	94.4 J	94.4 J	94.4 J	1120 UJ	681	852 UJ	1030 UJ
surface	Benzoic acid (ug/kg)	7	5	71.4	498 J	4110 J	2940	3300 J	3990 J	64.2 U	4110 J	2140	2800 J	3990 J
surface	Benzyl alcohol (ug/kg)	7	0	0						19 U	472 UJ	248	358 UJ	434 UJ
surface	Bis(2-chloroethoxy) methane (ug/kg)	7	0	0						19 U	270 UJ	143	205 UJ	248 UJ
surface	Bis(2-chloroethyl) ether (ug/kg)	7	0	0						36.1 U	429 UJ	229	326 UJ	395 UJ
surface	Carbazole (ug/kg)	7	0	0						19 U	877 UJ	459	665 UJ	807 UJ
surface	Dibenzofuran (ug/kg)	9	2	22.2	15	26	20.5	15	15	15	261 UJ	112	26	240 UJ
surface	Hexachlorobenzene (ug/kg)	7	1	14.3	4.65 P	4.65 P	4.65	4.65 P	4.65 P	2.45 U	19 U	5.51	3.29 U	4.65 P
surface	Hexachlorobutadiene (ug/kg)	7	0	0						2.45 U	19 U	5.27	2.97 U	3.3 U
surface	Hexachlorocyclopentadiene (ug/kg)	7	0	0						26.6 U	317 UJ	179	240 UJ	292 UJ
surface	Hexachloroethane (ug/kg)	7	0	0						2.45 U	19 U	5.27	2.97 U	3.3 U
surface	Isophorone (ug/kg)	7	0	0						19 U	315 UJ	167	239 UJ	290 UJ
surface	Nitrobenzene (ug/kg)	7	0	0						19 UJ	308 UJ	163	234 UJ	283 UJ
surface	N-Nitrosodimethylamine (ug/kg)	6	0	0						20.8 U	247 UJ	150	188 UJ	228 UJ
surface	N-Nitrosodipropylamine (ug/kg)	7	0	0						20.8 U	247 UJ	134	188 UJ	228 UJ
surface	N-Nitrosodiphenylamine (ug/kg)	7	0	0						15.1 U	180 UJ	96.4	136 UJ	166 UJ
surface	Bis(2-chloroisopropyl) ether (ug/kg)	6	0	0						49.1 U	584 UJ	355	443 UJ	538 UJ
surface	1,2-Dichlorobenzene (ug/kg)	7	0	0						19 U	232 UJ	123	176 UJ	213 UJ
surface	1,3-Dichlorobenzene (ug/kg)	7	0	0						19 U	315 UJ	167	239 UJ	290 UJ
surface	1,4-Dichlorobenzene (ug/kg)	7	0	0						19 U	360 UJ	190	273 UJ	331 UJ
surface	1,2,4-Trichlorobenzene (ug/kg)	7	0	0						15.7 U	187 UJ	100	142 UJ	172 UJ
subsurface	Total organic carbon (percent)	1	1	100	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
subsurface	Gravel (percent)	1	1	100	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39
subsurface	Sand (percent)	1	1	100	34.07	34.07	34.1	34.07	34.07	34.07	34.07	34.1	34.07	34.07
subsurface	Fines (percent)	1	1	100	61.54	61.54	61.5	61.54	61.54	61.54	61.54	61.5	61.54	61.54
subsurface	Silt (percent)	1	1	100	43.12	43.12	43.1	43.12	43.12	43.12	43.12	43.1	43.12	43.12
subsurface	Clay (percent)	1	1	100	18.42	18.42	18.4	18.42	18.42	18.42	18.42	18.4	18.42	18.42
subsurface	Aluminum (mg/kg)	1	1	100	29200	29200	29200	29200	29200	29200	29200	29200	29200	29200
subsurface	Antimony (mg/kg)	1	0	0						4 UJ	4 UJ	4	4 UJ	4 UJ
subsurface	Arsenic (mg/kg)	1	0	0						4 U	4 U	4	4 U	4 U
subsurface	Cadmium (mg/kg)	1	1	100	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
subsurface	Chromium (mg/kg)	1	1	100	40.2	40.2	40.2	40.2	40.2	40.2	40.2	40.2	40.2	40.2
subsurface	Copper (mg/kg)	1	1	100	43.4	43.4	43.4	43.4	43.4	43.4	43.4	43.4	43.4	43.4
subsurface	Lead (mg/kg)	1	1	100	27	27	27	27	27	27	27	27	27	27
subsurface	Manganese (mg/kg)	1	1	100	431	431	431	431	431	431	431	431	431	431
subsurface	Mercury (mg/kg)	1	1	100	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
subsurface	Nickel (mg/kg)	1	1	100	25	25	25	25	25	25	25	25	25	25
subsurface	Selenium (mg/kg)	1	1	100	9	9	9	9	9	9	9	9	9	9
subsurface	Silver (mg/kg)	1	1	100	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
subsurface	Thallium (mg/kg)	1	1	100	4	4	4	4	4	4	4	4	4	4
subsurface	Zinc (mg/kg)	1	1	100	116	116	116	116	116	116	116	116	116	116

Table 2. Queried Sediment Chemistry Data.

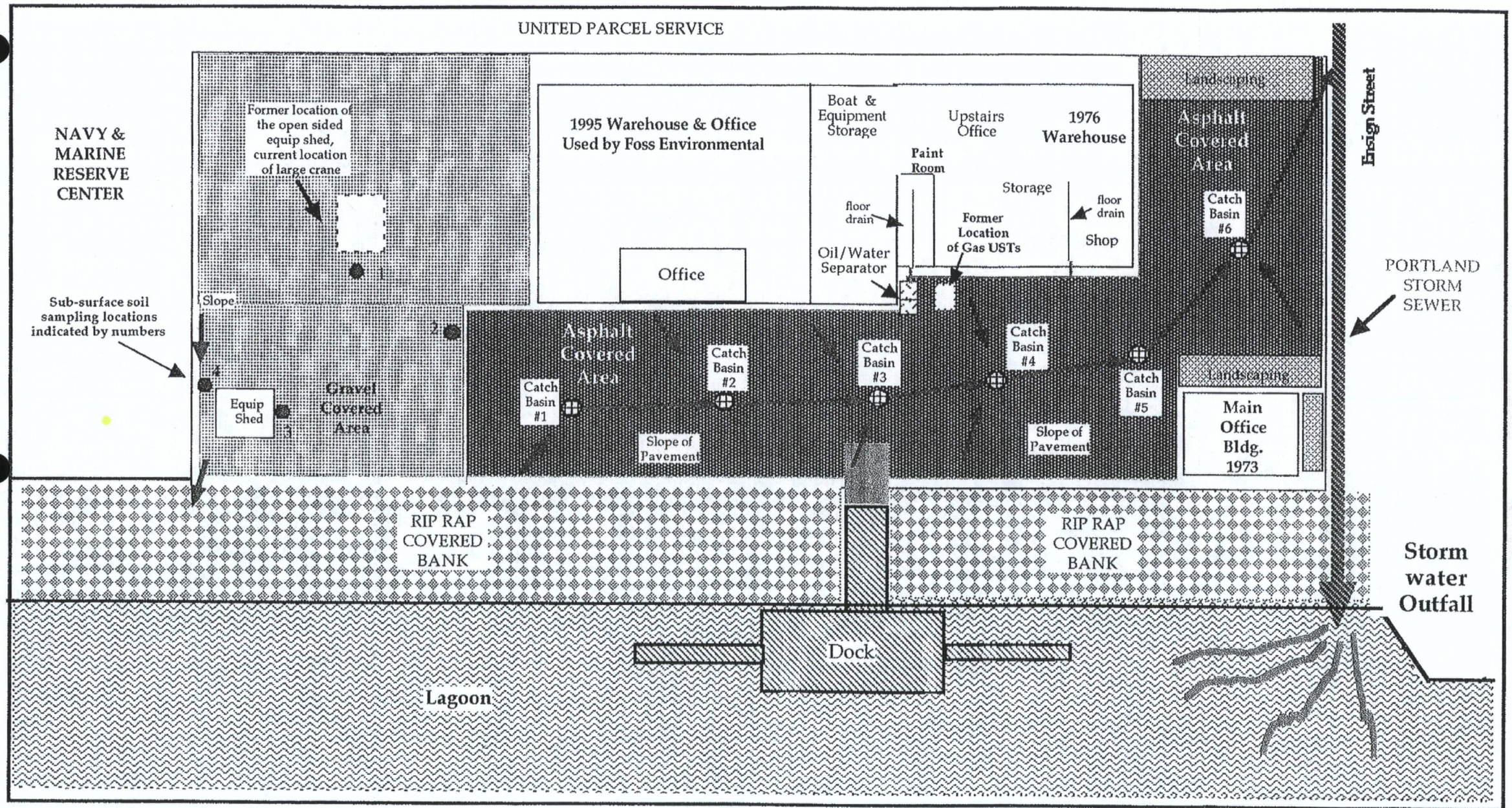
Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
subsurface	Barium (mg/kg)	1	1	100	168	168	168	168	168	168	168	168	168	168
subsurface	Beryllium (mg/kg)	1	1	100	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
subsurface	Calcium (mg/kg)	1	1	100	8080	8080	8080	8080	8080	8080	8080	8080	8080	8080
subsurface	Cobalt (mg/kg)	1	1	100	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4
subsurface	Iron (mg/kg)	1	1	100	35400	35400	35400	35400	35400	35400	35400	35400	35400	35400
subsurface	Magnesium (mg/kg)	1	1	100	5550	5550	5550	5550	5550	5550	5550	5550	5550	5550
subsurface	Potassium (mg/kg)	1	1	100	1060	1060	1060	1060	1060	1060	1060	1060	1060	1060
subsurface	Sodium (mg/kg)	1	1	100	1320 J	1320 J	1320	1320 J	1320 J	1320 J	1320 J	1320	1320 J	1320 J
subsurface	Vanadium (mg/kg)	1	1	100	89.9	89.9	89.9	89.9	89.9	89.9	89.9	89.9	89.9	89.9
subsurface	2-Methylnaphthalene (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	Acenaphthene (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	Acenaphthylene (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	Anthracene (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	Fluorene (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	Naphthalene (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	Phenanthrene (ug/kg)	1	1	100	61	61	61	61	61	61	61	61	61	61
subsurface	Low Molecular Weight PAH (ug/kg)	1	1	100	61 A	61 A	61	61 A	61 A	61 A	61 A	61	61 A	61 A
subsurface	Dibenz(a,h)anthracene (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	Benz(a)anthracene (ug/kg)	1	1	100	40	40	40	40	40	40	40	40	40	40
subsurface	Benzo(a)pyrene (ug/kg)	1	1	100	48	48	48	48	48	48	48	48	48	48
subsurface	Benzo(b)fluoranthene (ug/kg)	1	1	100	46	46	46	46	46	46	46	46	46	46
subsurface	Benzo(g,h,i)perylene (ug/kg)	1	1	100	48	48	48	48	48	48	48	48	48	48
subsurface	Benzo(k)fluoranthene (ug/kg)	1	1	100	42	42	42	42	42	42	42	42	42	42
subsurface	Chrysene (ug/kg)	1	1	100	60	60	60	60	60	60	60	60	60	60
subsurface	Fluoranthene (ug/kg)	1	1	100	130	130	130	130	130	130	130	130	130	130
subsurface	Indeno(1,2,3-cd)pyrene (ug/kg)	1	1	100	33	33	33	33	33	33	33	33	33	33
subsurface	Pyrene (ug/kg)	1	1	100	130	130	130	130	130	130	130	130	130	130
subsurface	Benzo(b+k)fluoranthene (ug/kg)	1	1	100	88 A	88 A	88	88 A	88 A	88 A	88 A	88	88 A	88 A
subsurface	High Molecular Weight PAH (ug/kg)	1	1	100	577 A	577 A	577	577 A	577 A	577 A	577 A	577	577 A	577 A
subsurface	Polycyclic Aromatic Hydrocarbons (ug/kg)	1	1	100	638 A	638 A	638	638 A	638 A	638 A	638 A	638	638 A	638 A
subsurface	2,4,5-Trichlorophenol (ug/kg)	1	0	0						97 U	97 U	97	97 U	97 U
subsurface	2,4,6-Trichlorophenol (ug/kg)	1	0	0						97 U	97 U	97	97 U	97 U
subsurface	2,4-Dichlorophenol (ug/kg)	1	0	0						58 U	58 U	58	58 U	58 U
subsurface	2,4-Dimethylphenol (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	2,4-Dinitrophenol (ug/kg)	1	0	0						190 UJ	190 UJ	190	190 UJ	190 UJ
subsurface	2-Chlorophenol (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	2-Methylphenol (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	2-Nitrophenol (ug/kg)	1	0	0						97 U	97 U	97	97 U	97 U
subsurface	4,6-Dinitro-2-methylphenol (ug/kg)	1	0	0						190 UJ	190 UJ	190	190 UJ	190 UJ
subsurface	4-Chloro-3-methylphenol (ug/kg)	1	0	0						39 U	39 U	39	39 U	39 U
subsurface	4-Methylphenol (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	4-Nitrophenol (ug/kg)	1	0	0						97 U	97 U	97	97 U	97 U
subsurface	Pentachlorophenol (ug/kg)	1	0	0						97 UJ	97 UJ	97	97 UJ	97 UJ
subsurface	Phenol (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	Dimethyl phthalate (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U

Table 2. Queried Sediment Chemistry Data.

Surface or Subsurface	Analyte	Number of Samples	Number Detected	% Detected	Detected Concentrations Minimum	Maximum	Mean	Median	95th	Detected and Nondetected Concentrations Minimum	Maximum	Mean	Median	95th
subsurface	Diethyl phthalate (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	Dibutyl phthalate (ug/kg)	1	1	100	44	44	44	44	44	44	44	44	44	44
subsurface	Butylbenzyl phthalate (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	Di-n-octyl phthalate (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	Bis(2-ethylhexyl) phthalate (ug/kg)	1	1	100	370	370	370	370	370	370	370	370	370	370
subsurface	Bis(2-chloro-1-methylethyl) ether (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	2,4-Dinitrotoluene (ug/kg)	1	0	0						97 U	97 U	97	97 U	97 U
subsurface	2,6-Dinitrotoluene (ug/kg)	1	0	0						97 U	97 U	97	97 U	97 U
subsurface	2-Chloronaphthalene (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	2-Nitroaniline (ug/kg)	1	0	0						97 U	97 U	97	97 U	97 U
subsurface	3,3'-Dichlorobenzidine (ug/kg)	1	0	0						97 U	97 U	97	97 U	97 U
subsurface	3-Nitroaniline (ug/kg)	1	0	0						120 UJ	120 UJ	120	120 UJ	120 UJ
subsurface	4-Bromophenyl phenyl ether (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	4-Chloroaniline (ug/kg)	1	0	0						58 U	58 U	58	58 U	58 U
subsurface	4-Chlorophenyl phenyl ether (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	4-Nitroaniline (ug/kg)	1	0	0						97 UJ	97 UJ	97	97 UJ	97 UJ
subsurface	Benzoic acid (ug/kg)	1	0	0						190 U	190 U	190	190 U	190 U
subsurface	Benzyl alcohol (ug/kg)	1	0	0						19 UJ	19 UJ	19	19 UJ	19 UJ
subsurface	Bis(2-chloroethoxy) methane (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	Bis(2-chloroethyl) ether (ug/kg)	1	0	0						39 U	39 U	39	39 U	39 U
subsurface	Carbazole (ug/kg)	1	0	0						19 UJ	19 UJ	19	19 UJ	19 UJ
subsurface	Dibenzofuran (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	Hexachlorobenzene (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	Hexachlorobutadiene (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	Hexachlorocyclopentadiene (ug/kg)	1	0	0						97 UJ	97 UJ	97	97 UJ	97 UJ
subsurface	Hexachloroethane (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	Isophorone (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	Nitrobenzene (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	N-Nitrosodipropylamine (ug/kg)	1	0	0						39 U	39 U	39	39 U	39 U
subsurface	N-Nitrosodiphenylamine (ug/kg)	1	0	0						19 UJ	19 UJ	19	19 UJ	19 UJ
subsurface	1,2-Dichlorobenzene (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	1,3-Dichlorobenzene (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	1,4-Dichlorobenzene (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U
subsurface	1,2,4-Trichlorobenzene (ug/kg)	1	0	0						19 U	19 U	19	19 U	19 U

SUPPLEMENTAL FIGURES

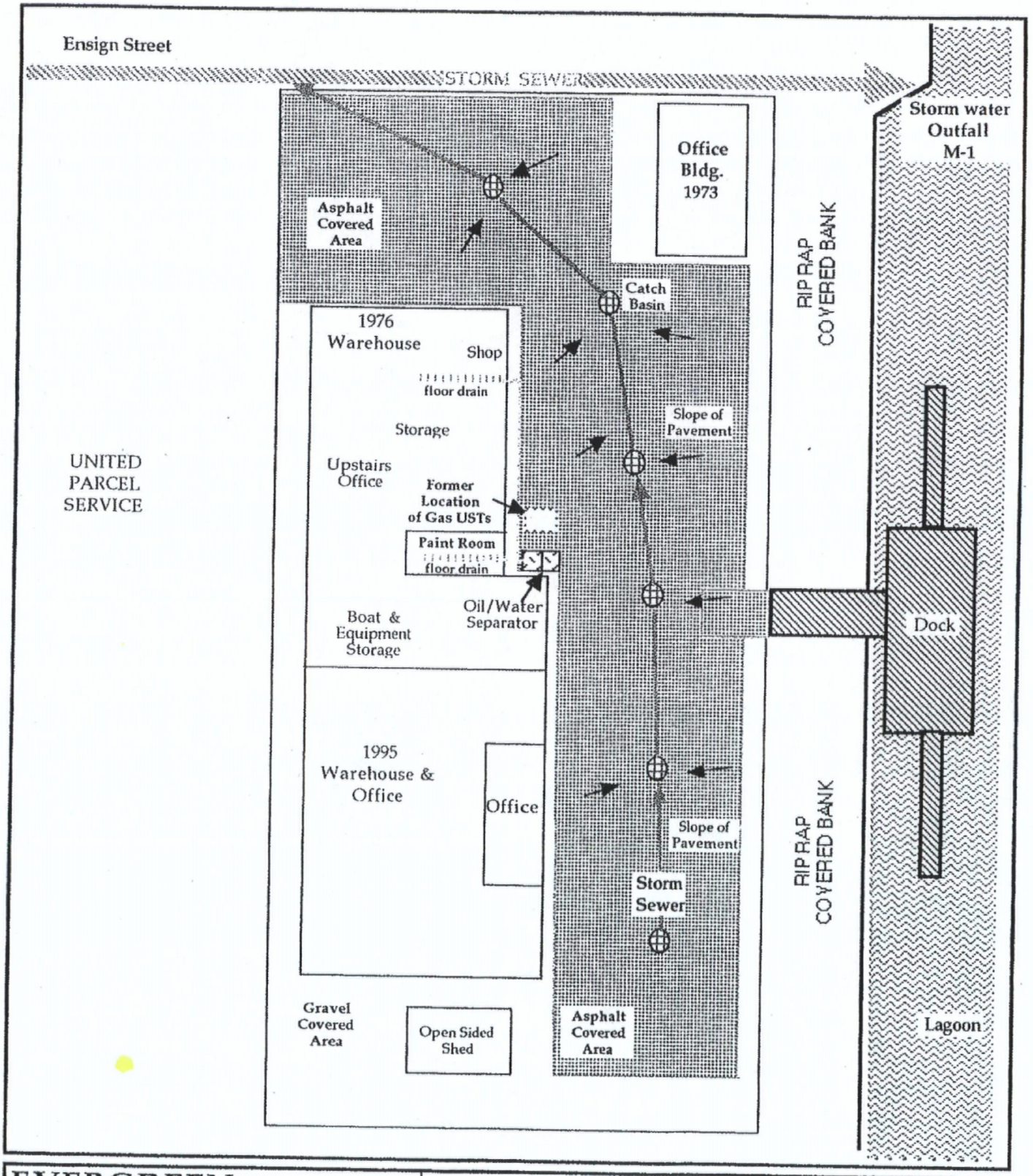
Figure 4. Site Diagram (EEM 2001)
Figure 5. Sample Locations (EEM 2003)



EVERGREEN ENVIRONMENTAL MANAGEMENT, LLC
P.O. Box 1604
Beaverton, OR 97075-1604

FIGURE IS NOT TO SCALE

FIGURE NO. 4 Project Site Map
Fred Devine Diving & Salvage
6211 N. Ensign Drive
Portland, OR



EVERGREEN ENVIRONMENTAL MANAGEMENT, INC.
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FIGURE NO. 5 Project #01-06
Project Site Map
Fred Devine Diving & Salvage Facility
6211 N Ensign Drive
Portland, Oregon